Moving Multi-combination Vehicles on Brisbane’s Urban Arterial Roads

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Researchers at Queensland University of Technology (Brisbane, Australia) are studying the impacts of multi-combination vehicles, such as the popular 25m B-double, on arterial road traffic operation. A PhD project is examining the impact of MCVs on traffic progression along the Brisbane Urban Corridor, which includes Riawena and Kessells Roads, while a Masters project is examining the lateral position impacts on a section of the Gateway Motorway.

Road freight transport in Queensland has been increasing 8% annually over the past 10 years and recent forecasts by BTE (2002) anticipate it to more than double by 2020, growing faster than the national GDP. The heavy vehicle fleet spectrum is expected to polarise, with much of the increased demand being taken up by MCVs such as B-doubles at the upper end of the spectrum, where size gives substantial productivity gains, and light commercial vehicles at the lower end where accessibility is critical. Transit time matters across the whole spectrum, but we are finding that the proliferation of freight traffic in urban areas is contributing to the traffic congestion problem. Other concerns raised over MCVs, in both urban and rural situations, relate to perceived road user amenity and safety impacts. This project was developed to help address some of these concerns, and to inform guidelines being developed by Queensland Main Roads (QMR) to manage the operation of MCVs on Queensland’s road network.

The PhD project is aimed at increasing our understanding of some of the traffic impacts of MCVs by developing a model that can be used to estimate their delays, as well as delays to other road users, as a result of their movement along a signalised corridor. Research by QUT and QMR has already quantified, under controlled field trials, some of the dynamic and spatial characteristics of these vehicles and their affects on signalised intersection operation (Haldane and Bunker 2002, Bunker and Haldane 2003). However, further research is needed in this project to examine in-corridor conditions, and how MCVs affect the formation and dispersion of platoons of vehicles between intersections along a coordinated corridor.

Many existing microscopic traffic simulation models allow the user to tailor vehicle types such as heavy vehicles to a limited degree; however, driver behaviour and vehicle dynamic assumptions, particularly in relation to geometric effects, are known to need better calibration and stronger validation. Macroscopic models, such as those in popular intersection analysis products, historically assume a general heavy vehicle category that does not reflect new, larger vehicles with improved performance such as B-doubles. The model being developed will consider the trajectories of all vehicles in the stream along a signalised corridor, and will reflect the effects of road profile, amongst other parameters, including lane arrangements and signal timing. When complete, the model will be used to test various strategies for managing traffic flow along a signalised corridor; for instance, timing to minimise delay to a particular vehicle type such as an MCV. This tool will aid in setting traffic management policy.

The Masters project has continued a project that studied the lateral deviations of MCVs including a B-double, A-double and an A-triple road train at speeds of up to 90km/h on a rural highway west of Toowoomba (Lennie et al 2003). It has been found that the combinations underwent regular sideways oscillations as they travelled along the road, excited by steer action taken by the driver to correct for crossfall, along with pavement roughness, and cross-winds. For each MCV, trajectory histories of the prime mover and its
trailers are being studied to determine the lateral envelope used so that a lane width requirement may be compared with previous studies (Prem et al 1999). The variation in lane keeping performance between each MCV will also be addressed.

The Masters project is also studying how drivers position their vehicles around MCVs, compared to typical semi-trailers, rigid trucks and passenger cars, on a two-lane mainline section of the Gateway Motorway. This will enable us to understand whether drivers position themselves differently in the presence of MCVs, which will also assist in determining lane width requirements for MCVs on this type of facility. Passenger car equivalences of MCVs will be determined so that their effects on motorway capacity can be better appreciated. In both projects consideration will be given to the general application of findings to heavy vehicle management and traffic engineering practice.

Both projects are being undertaken by the Transport Research Group at QUT as part of an ARC linkages project with Queensland Main Roads.

References:

BTRE 2002. Presentation on Freight, October.


Prem H. et al 1999. Estimation of Lane Width Requirements for Heavy Vehicles on Straight Paths. ARR 342, AUSTROADS.

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